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Ornithomimosaur Cranial Material from Ukhaa Tolgod (Omnogov, Mongolia)

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ABSTRACT

The 1998 American Museum of Natural History–Mongolian Academy of Sciences expedition uncovered partial ornithomimosaur remains from the Xanadu sublocality at Uhkaa Tolgod. The specimen includes the rostral portion of the snout, the anterior portion of the mandible, and vertebral fragments. These remains cannot be assigned with certainty to any known ornithomimosaur genus. Examination of these materials allows new comments on ornithomimosaur palatal anatomy.

INTRODUCTION

Ukhaa Tolgod has yielded magnificent theropod fossils including a nesting oviraptorid (Clark et al., 1999), an oviraptorid embryo (Norell et al., 2001a), the troodontid *Byronosaurus jaffei* (Norell et al., 2000) and the alverezsaurid *Shuuvia deserti* (Chiappe et al., 1998). The specimen described in this paper (IGM 100/1245; fig. 1) was collected as a surface find during the 1998 field season at the Xanadu sublocality. Though incomplete, the specimen is remarkably well preserved. The palatal shelf of the premaxilla is more complete and well exposed than in any other reported ornithomimosaur specimen. The rostral portion of the mandible differs from known ornithomimosaurs where this element is preserved.

DESCRIPTION

The tip of the snout is U-shaped in dorsal profile, as in *Gallimimus*, *Garudimimus*, and *Sinornithomimus*, but differs from North American taxa (Makovicky et al., in press). The external surface of the premaxilla is pitted near the buchal margin anteriorly, but there is no pitting on the posterior half of the preserved region. At the anteriormost point

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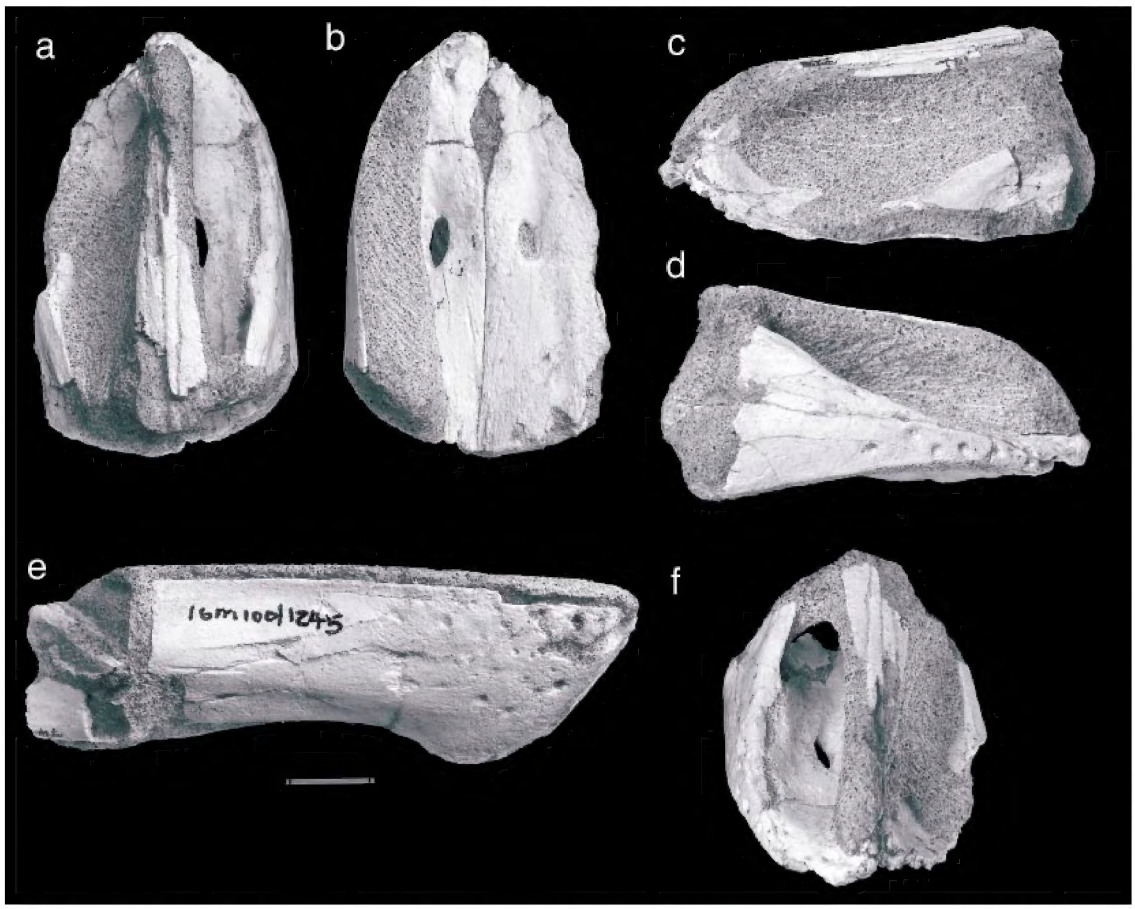

Fig. 1. Premaxillae and nasals of IGM 100/1245 in (**a**) dorsal, (**b**) ventral, (**c**) left lateral, (**d**) right lateral, and (**f**) anterior oblique views. Right dentary in (**e**) lateral view. Scale bar = 1 cm.

of the snout, the external portion of the premaxilla is nearly level with the palatal plane. Posteriorly, the external surface extends both above and below the palatal plane. The ventral edge is extremely thin, and the posterior portion curves medially. The internarial bar is poorly preserved at its base, but dorsally it exhibits the T-shaped cross section characteristic of ornithomimosaurs.

The premaxillae meet at the midline to form a thin, flat palatal shelf. A large, anteroposteriorly elongate, incisive foramen is situated at midline immediately posterior to the anterior edge of the rostrum. The incisive foramen opens into a passage bounded by two sharp ridges on the floor of the narial chamber. This passage is more clearly visible in IGM 100/1133, a juvenile *Gallimimus bullatus* (see Norell et al., 2001b), in which the ridges decrease in height posteriorly. There is a slight ventral bulge on the palate along the premaxillary suture, posterior to the incisive foramen. The presence of an incisive foramen has been reported in only one other theropod group, the Therizinosauridae. Clark et al. (1994) noted several small foramina bordering, and one lateral to, the incisive foramen in the therizinosaurid *Erlicosaurus*, but these are absent in IGM100/1245. An incisive foramen is not present in oviraptorosaurs, another theropod group with an extensive premaxillary palatal shelf.

A pair of oval foramina perforate the premaxillae lateral and posterior to the incisive foramen. These foramina open into the narial chamber. A distinct groove runs anteriorly from each foramen along the ventral surface of the premaxilla and a counterpart groove

runs posteriorly along the floor of the narial chamber. The identity of these foramina is uncertain. They have not previously been reported in ornithomimosaurs, but are also preserved in the holotype of *Garudimimus brevipes* (Kobayashi, personal commun.). One specimen of *Struthiomimus* (RTMP 90.62.1) preserves foramina in the maxillary portion of the palatal shelf (Makovicky et al., in press). Unfortunately, the premaxilla is incompletely exposed in this specimen. The palatal shelf of the premaxilla is missing, poorly preserved, or unprepared in most other ornithomimosaur specimens. Paired dorsoventrally elongate subnarial foramina are present between the premaxilla and maxilla in *Tyrannosaurus* (Molnar, 1991), and it is possible these are homologous to the foramina in ornithomimosaurs. There are no foramina in this area in other coelurosaurian taxa in which this region is well preserved, including oviraptorids (Elzanowski, 1996) and *Erlicosaurus* (Clark et al., 1994).

The rostral tip of the right dentary is preserved along with a sliver of the left dentary at the symphysis. The tip of the mandible has a straight dorsal margin. The ventral margin has a pronounced convexity near the symphysis. The ventral bulge is more abrupt and pronounced than in other ornithomimosaur mandibles (Hurum, 2001), but these differences may prove not to be diagnostic given the imperfect preservation of some specimens. The external surface of the dentary is pitted along and below the buchal margin anteriorly. As in the premaxilla, the pitting is absent in the posterior portion of the mandible, suggesting the rhamphotheca, if present, was restricted to the anterior portion of the muzzle as in other Asian ornithomimosaurs (Kobayashi and Lü, 2003).

Several fragmentary vertebral elements are preserved, including a transverse process, a spinous process, and an articulated pair of pre- and postzygapophyses. The orientation of the zygapophyses and size and shape of the other elements suggest they are fragments of dorsal vertebrae. The vertebral elements exhibit heavy pneumatization. Both the spinous process and transverse process are extensively hollowed, and two pneumatopores open into the neural arch near the base of the transverse process. Several air chambers are exposed in the prezygapophyses and the attached portion of the neural arch. Comparison of the vertebral elements preserved in IGM 100/1245 with material of *Archaeornithomimus asiaticus* suggests this individual was similar in size to that species.

DISCUSSION

The Xanadu ornithomimosaur cannot presently be assigned to any known taxon. Several toothless ornithomimosaur taxa are known from Asia. *Gallimimus* is known from the Maastrichtian Nemegt Formation at several localities (Osmólska et al., 1972) and *Garudimimus* is represented by a single individual from the Cenomanian–Turonian Bayanshiree beds at Baisin Tsav (Barsbold, 1981). It is unlikely IGM100/1245 represents *Gallimimus* or *Garudimimus* because of differences in the shape of the mandible and the age disparity with these taxa. The mandible is well preserved and distinct from IGM100/1245 in the recently described ornithomimid *Sinornithomimus* from the Late Cretaceous of China (Kobayashi and Lü, 2003). Unfortunately the lack of cranial remains for *Archaeornithomimus* from the Iren Dabasu Formation (Gilmore, 1933) and *Anserimimus* from the Nemegt Formation (Barsbold, 1988) precludes comparison with these taxa.

An ornithomimosaur braincase (IGM 100/987) from the "Ankylosaur Flats" sublocality at Ukhaa Tolgod has been described (Mackovicky and Norell, 1998). Like IGM100/1245, this braincase is currently unassignable to any known taxon. The lack of shared preserved elements prevents direct comparison of these contemporaneous specimens, though it is clear the Ankylosaur Flats ornithomimid was significantly smaller than IGM100/1245. The possibility that the Ankylosaur Flats ornithomimid represents a smaller individual of the same taxon as IGM 100/1245 cannot be completely ruled out. However, as can be determined by the degree of fusion of the braincase, IGM 100/987 was near somatic maturity.

The Xanadu ornithomimosaur represents the second ornithomimosaur find collected from Ukhaa Tolgod. The excellent preservation both of IGM 100/1245 and at the site in general indicate it may yield important fu-

ture specimens of this group. Taxonomic placement of the two Ukhaa Tolgod ornithomimosaurs may become possible with such discoveries.

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REFERENCES

Barsbold, R. 1981. [Toothless carnivorous dinosaurs of Mongolia]. Trudy Sovmestnoi Sovetsko-Mongol'skoi Paleontologicheskoi Ekspeditsii 15: 28–39.

Barsbold, R. 1988. A new Late Cretaceous ornithomimid from the Mongolian People's Republic. Paleontological Journal (1): 124–127.

Chiappe, L.M., M.A. Norell, and J.M. Clark. 1998. The skull of a relative of the stem-group bird *Mononykus*. Nature 392: 275–278.

Clark, J.M., M.A. Norell, and L.M. Chiappe. 1999. An oviraptorid skeleton from the Late Cretaceous of Ukhaa Tolgod, Mongolia, preserved in an avianlike brooding position over an oviraptorid nest. American Museum Novitates 3265: 1–36.

Clark, J.M., A. Perle, and M.A. Norell. 1994. The skull of *Erlicosaurus andrewsi*, a Late Cretaceous "segnosaur" (Theropoda: Therizinosauridae) from Mongolia. American Museum Novitates 3115: 1–39.

Elzanowski, A. 1996. A comparison of the jaw skeleton in theropods and birds, with a description of the palate in the Oviraptoridae. *In* S.L. Olson (editor), Avian paleontology at the close of the 20th century: proceedings of the 4th International Meeting of the Society of Avian Paleontology and Evolution, Washington, D.C., 4–7 June 1996. Smithsonian Contributions to Paleontology 89: 311–323.

Gilmore, C.W. 1933. On the dinosaurian fauna of the Iren Dabasu Formation. Bulletin of the Museum of the American Museum of Natural History 67: 23–78.

Hurum, J.H. 2001. Lower jaw of *Gallimimus bullatus*. *In* D.H. Tanke and K. Carpenter (editors), Mesozoic vertebrate life: 34–41. Indianapolis: Indiana University Press.

Kobayashi, Y., and J. Lü. 2003. A new ornithomimid dinosaur with gregarious habits from the Late Cretaceous of China. Acta Paleontologica Polonica 48(2): 235–259.

Makovicky, P.J., Y. Kobayashi, and P.J. Currie. In press. Ornithomimosauria. *In* D.B. Weishampel, P. Dodson, and H. Osmolska (editors), The Dinosauria, 2nd ed., Berkeley: University of California Press.

Makovicky, P.J., and M.A. Norell. 1998. A partial ornithomimid braincase from Ukhaa Tolgod (Upper Cretaceous, Mongolia). American Museum Novitates 3247: 1–16.

Molnar, R.E. 1991. The cranial morphology of *Tyrannosaurus rex*. Palaeontographica Abteilung A: Palaeozoologie-Stratigraphie 217(4–6): 137–176.

Norell, M.A., J.M. Clark, and L.M. Chiappe. 2001a. An embryonic oviraptorid (Dinosauria: Theropoda) from the Upper Cretaceous of Mongolia. American Museum Novitates 3315: 1–17.

Norell, M.A., P.J. Makovicky, and J.M. Clark. 2000. A new troodontid from Ukhaa Tolgod, Late Cretaceous, Mongolia. Journal of Vertebrate Paleontology 20(1): 7–11.

Norell, M.A., P.J. Makovicky, and P.J. Currie. 2001b. The beaks of ostrich dinosaurs. Nature 412: 873–874.

Osmólska, H., E. Roniewicz, and R. Barsbold. 1972. A new dinosaur, *Gallimimus bullatus* n. gen., n. sp. (Ornithomimidae) from the Upper Cretaceous of Mongolia. Paleontologica Polonica 27: 103–143.

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